STRUCTURE FOR REDUCING NOISE AND VIBRATION OF SCROLL COMPRESSOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a structure for reducing noise and vibration of a scroll compressor, and particularly to a suction head of a structure for reducing noise and vibration of a scroll compressor capable of reducing noise and vibration generated in driving a compressor, by separated-assembling a vibration unit and compressing unit from a casing.

2. Description of the Background Art

Generally, a compressor changes mechanical energy into latent energy of compressive fluid and conventionally is classified into a reciprocating-type, scroll-type, centrifugal-type and vane-type.

Among these, the scroll-type compressor sucks/compresses/discharges gas using a rotary element as the centrifugal-type or vane-type unlike the reciprocating-type which uses a linear reciprocating movement of a piston.

Figure 1 is a longitudinal sectional view showing an example of a conventional scroll compressor.

The conventional scroll compressor includes a casing 1 filled with oil to a certain height, a main frame 2 and sub frame 3 which are fixed at upper and lower

sides of the inner circumferential surface of the casing 1, a driving motor which is positioned between the main frame 2 and sub frame 3, being composed of a stator 4A and rotor 4B, a driving shaft 5 pressed at the center portion of the rotor 4B of the driving motor 4, for transmitting a driving force generated in the driving motor 4 penetrating the main frame 2, an orbiting scroll 6 placed on the upper surface of the main frame 2 combined to the driving shaft 5, a fixed scroll 7 combined to the orbiting scroll 6 and fixed on the upper surface of the main frame 2 to form a plurality of compression pockets, a high/low pressure separation plate 8 combined on the rear surface of the fixed scroll 7, for dividing the inner portion of the main frame 2 into a suction pressure area and a discharge pressure area and a non-return valve assembly 9 combined on the rear surface of the fixed scroll 7, for preventing a reverse flow of discharged refrigerant gas.

The casing 1 has a suction pipe (SP) at one side and a discharge pipe (DP) at the other side centering around the high/low pressure separation plate 8. Accordingly, the suction pipe (SP) is connected to a suction pressure area and the discharge pipe (DP) is connected to a discharge pressure area.

The main frame 2 and the sub frame 3 are all fixed on the inner circumferential surface of the casing 1 by the method of welding and the like and the fixed scroll 7 is fixed-combined on the lower surface of the high/low pressure separation plate 8.

On the corresponding surfaces of the orbiting scroll 6 and fixed scroll 7, wraps 6A and 7A meshed each other being continuously moved, which form an involute curve to form a plurality of compression pockets are formed.

In the drawings, undescribed reference numeral 7b designates a suction port, 7c designates a discharge port and O designates an oil feeder.

Hereinafter, the operation of the conventional scroll compressor with the above construction will be described as follows.

First, when a power is applied to the stator 4A of the driving motor 4, the rotor 4B rotates with the driving shaft 5 at the inner side of the stator 4A and the orbiting scroll 6 orbits as long as an eccentric distance. At the same time, a wrap 6a of the orbiting scroll 6 forms a plurality of compression pockets between itself and the wrap 7a of the fixed scroll 7 and the compression pocket moves to the center side of the scrolls by the continuous orbiting movement of the orbiting scroll 6. The compression pocket sucks/compresses/discharges refrigerant gas as the volume of the pocket is reduced.

However, in the conventional scroll compressor, the driving shaft 5 for transmitting a power of the vibration unit to a compressing unit is combined to the main frame 2 and sub frame 3 and vibration of the compressing unit is transmitted to the exterior of the casing 1 and noise and vibration are generated as the main frame 2 and the sub frame 3 are abutted-combined on the casing 1.

Also, a portion of the casing 1 forms a discharge chamber together with the high/low pressure separation plate 8 but in this case, the refrigerant gas with high pressure is collided with the casing 1 and increases vibration and noise.

Also, the discharge pipe (DP) is directly connected to the discharge chamber composed of the casing 1 and high/low pressure separation plate 8 and accordingly vibration and noise by discharge gas with high pressure can not be reduced.

SUMMARY OF THE INVENTION

Therefore, the present invention provides a structure for reducing noise and vibration of a scroll compressor with low noise and vibration by reducing vibration of a compressing unit and vibration unit transmitted to an exterior of a casing.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided a structure for reducing noise and vibration of a scroll compressor including an outer casing connected-combined with a suction pipe and discharge pipe respectively, an inner casing combined with the inner circumferential surface of the outer casing, a driving motor combined with the inner circumferential surface of the inner casing, for generating a rotation force, a driving shaft combined with a rotor for transmitting the rotation force, a fixed scroll for forming a plurality of compression pockets which continuously move, combined with an orbiting scroll orbiting eccentrically combined with the driving shaft and the orbiting scroll and forming a discharge port, a frame fixed-combined on the inner circumferential surface of the inner casing, for supporting the driving shaft and an elastic supporting means for elastically supporting both ends of the outer casing and inner casing.

The foregoing and other, features, aspects and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further

understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

Figure 1 is a longitudinal sectional view showing an example of a conventional scroll compressor;

Figure 2 is a longitudinal sectional view showing an example of a structure for reducing noise and vibration of a scroll compressor in accordance with the present invention; and

Figure 3 is a modified example and main portion of the structure for reducing noise and vibration of the scroll compressor in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

Reference numeral which are same as the conventional art designates the same reference numeral and the description will be omitted.

The scroll compressor in accordance with the present invention includes an outer casing 11 connected to a suction pipe (SP) and discharge pipe (DP) and filled with oil to a certain height, an inner casing 12 elastically supported in the outer casing 11, a main frame 13 and sub frame 14 which are fixed at upper and lower sides of the inner circumferential surface of the inner casing 12, a driving motor 15 which is positioned between the main frame 13 and sub frame 14, being

composed of a stator 15A and rotor 15B, a driving shaft 16 pressed at the center portion of the rotor 15B of the driving motor 15, for transmitting a driving force generated in the driving motor 15, penetrating the main frame 13, an orbiting scroll 17 placed on the upper surface of the main frame 13 combined to the driving shaft 16, a fixed scroll 18 combined to the orbiting scroll 17 and fixed on the upper surface of the main frame 13 to form a plurality of compression pockets, a non-return valve assembly 19 combined to accommodate the discharge port 18c of the fixed scroll 18, for preventing a reverse flow of the compressed refrigerant gas, a discharge plenum 20 combined on the rear surface of the fixed scroll 18 to accommodate the non-return valve assembly 19 and a loop pipe 21 having an end connected to the discharge plenum 20 and the other end connected to the discharge pipe of the outer casing 11.

At least three outer supporting protrusion portions 11a are formed having a same height on the inner circumferential surface and at least inner supporting protrusion portions 12a are formed at the position on a perpendicular line opposed to the outer supporting protrusion portion 11a on the outer circumferential surface of the inner casing 12.

Spring fixing members 23a and 23b are inserted-combined at the outer supporting protrusion portion 11a and the inner supporting protrusion portion 12a and an elastic member composed of the coil spring 22 for electrically supporting the inner casing 12 on the outer casing 11 is positioned on the opposed surface of the spring fixing member 23a and 23b.

Hereinafter, a modified embodiment of the structure for reducing noise and vibration of the scroll compressor in accordance with the present invention will be described with reference to the accompanied drawings.

First, as shown in Figure 3, a plurality of elastic mounting holes 12b are formed having a same height at a certain portion of the inner casing 12 and the outer supporting protrusion portions 11a are combined on the inner circumferential surface of the outer casing 11 penetrating the elastic mounting holes 12b. A plurality of spring fixing members 23a are combined at a side of the outer supporting protrusion portion 11a.

Then, a plurality of spring fixing members 23b are combined having a same height in a certain portion of the main frame 13 and an elastic member composed of a compression coil spring for supporting the inner casing 12 on the outer casing 11 is positioned on the opposed surface between the plurality of spring fixing members 23b and spring fixing members 23a, thus to reduce the outer diameter of the whole compressor.

Also, though not described with a drawing, the inner casing 12 can be supported by hanging the upper end on the outer casing 11 or supporting the lower surface of the inner casing 12 with the bottom surface of the outer casing 11.

It is desirable that the inner casing 12 has a lower end which is elastically supported having a certain height difference from the bottom surface of the outer casing 11.

Also, it is desirable that the lower end of the driving shaft 16 is at least formed longer than the lower end of the inner casing 12 to attenuate vibration generated when oil is sucked up with an oil feeder O.

The discharge plenum 20 can be formed by continuously connecting a plurality of discharge spaces horizontally or vertically.

Also, it is desirable that the loop pipe 21 is formed as a spring pipe to set off the vibration generated in compressing and discharging and bound in various

forms between the outer casing 11 and the inner casing 12 to suck vibration by itself. More desirably, it is desirable that the loop pipe 21 is connected to the discharge pipe after being bound not abutted on the inner circumferential surface of the outer casing 11.

Undescribed reference numerals 17a and 18a are wraps of respective scrolls.

Hereinafter, the operation and effect of the structure for reducing noise and vibration of the scroll compressor in accordance with the present invention will be described as follows.

First, when a power is applied to the stator 15A of the driving motor 15, the orbiting scroll 6 orbits as long as an eccentric distance as the rotor 15B rotates together with the driving shaft 16 at the inner side of the stator 15A. A wrap 17a of the orbiting scroll 17 forms a plurality of compression pockets which are composed of pairs between itself and the wrap 18a of the fixed scroll 18 by performing orbiting movement at a distance of the orbiting diameter centering around the shaft center by the oldham's coupling (no reference numeral) and the compression pocket moves to the center side of the scrolls by the continuous orbiting movement of the orbiting scroll 17. Accordingly, volume of the scroll is reduced and the sucked refrigerant gas is compressed, thus to discharging the compressed gas after the gas consecutively passes the discharge plenum 20, loop pipe 21 and discharge pipe (DP).

At this time, under the condition that the orbiting scroll 17 is meshed with the fixed scroll 18, vibration is generated in compressing refrigerant gas by the orbiting movement. However, as the main frame 13 supporting the orbiting scroll 17 and fixed scroll 18 is fixed on the inner casing 12 and the inner casing 12 is

elastically supported by the elastic member such as the compression coil spring 22, the vibration generated in compressing the refrigerant gas is prevented from being sucked to the compression coil spring between the inner casing 12 and outer casing 11, attenuated and transmitted to the outer casing 11.

On the other hand, in the process that the compressed refrigerant gas is discharged from the compression pocket to the discharge plenum 20, vibration by a pulsation pressure of the refrigerant gas is generated but the vibration is attenuated at the discharge plenum 20, thus to reduce the whole compressor vibration.

Particularly, in case of forming the discharge space of the discharge plenum 20 into many spaces, the compressed refrigerant gas passes respective discharge spaces and attenuated, thus to reduce noise of the compressor more.

Also, as the loop pipe 21 which is lengthened-positioned between the dishened-positioned between the disge pipe (DP) having its own elasticity is ~~bound on~~ the outer diameter of the inner casing 12 or combined by binding itself

Therefore, in the structure for reducing noise and vibration of the scroll compressor in accordance with the present invention, the vibration generated in compressing the refrigerant gas is attenuated by the elastic member between the inner casing and outer casing by fixing the compressing unit and the vibration unit on the inner casing and combining the outer casing to the outer side of the inner casing to be elastically supported.

As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should

be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalence of such metes and bounds are therefore intended to be embraced by the appended claims.

5

20040727.034307

What is claimed is:

1. A structure for reducing noise and vibration of a scroll compressor, comprising:

an outer casing connected-combined with a suction pipe and discharge pipe respectively;

an inner casing combined with the inner circumferential surface of the outer casing;

a driving motor combined with the inner circumferential surface of the inner casing, for generating a rotation force;

a driving shaft combined with a rotor for transmitting the rotation force;

a fixed scroll for forming a plurality of compression pockets which continuously move, combined with an orbiting scroll orbiting eccentrically combined with the driving shaft and the orbiting scroll and forming a discharge port;

a frame fixed-combined on the inner circumferential surface of the inner casing, for supporting the driving shaft; and

an elastic supporting means for elastically supporting the outer casing and inner casing.

2. The structure of claim 1, wherein the elastic supporting means comprises:

an outer supporting protrusion portion, three or more of which are formed along the inner circumferential surface at a same height as the inner circumferential surface of the outer casing;

a spring fixing member inserted-combined on one side surface of the outer supporting protrusion portion;

an inner supporting protrusion portion, three or more of which are formed on the perpendicular line opposed to the outer supporting protrusion portion on the outer circumferential surface of the inner casing;

a spring fixing member inserted-combined on one side of the inner supporting protrusion portion; and

an elastic member positioned between the opposed surfaces of the spring fixing members, for elastically supporting the inner casing on the outer casing.

3. The structure of claim 2, wherein the outer supporting protrusion portion and the inner supporting protrusion portion are protruded-formed on a same perpendicular line, having a certain height difference.

4. The structure of claim 1, wherein the elastic supporting means comprises:

an elastic member mounting hole, three or more of which are formed being penetrated at a certain portion of the inner casing;

an outer supporting protrusion portion, three or more of which are formed along the inner circumferential surface at a same height as the inner circumferential surface of the outer casing, protruding the elastic member mounting hole;

a spring fixing member inserted-combined on one side surface of the outer supporting protrusion portion;

a spring fixing member inserted-combined on one side of the main frame;

DOCKET ALARM

and

an elastic member positioned between the opposed surfaces of the spring fixing members, for elastically supporting the inner casing on the outer casing.

5. The structure of claim 1, wherein a discharge plenum connected with a discharge port, where one or more discharge space is formed, is positioned on the rear surface of the fixed scroll.

6. The structure of claim 5, wherein a loop pipe for connecting a final discharge space and a discharge pipe of the outer casing is connected-combined at one side of the discharge plenum.

7. The structure of claim 1, wherein the lower end of the driving shaft is formed longer than the lower end of the inner casing.

8. The structure of claim 1, wherein the elastic member is composed of a coil spring.

9. The structure of claim 6, wherein the loop pipe is composed of a spring pipe which has elasticity.